Buena Vista Coalition
SDEAR Work Plan

Proximity to Surface Waters

Buena Vista Coalition

525 North Main Street

Buttonwillow, CA

April 15, 2016

Prepared by:

Timothy Ashlock, PE

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel or represented Members properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment for violations.

Timothy Ashlock

April 15, 2016

Expires 6-30-2016

The Buena Vista Coalition (BVC) did receive the Conditional Approval in a letter dated November 5, 2015 from the Report submitted February 4, 2015. In the CVRWQB letter there was additional work requested to secure an unconditional approval. Below is a review of the comments requiring additional work by the BVC. Subsequently, the Regional Board required a Work Plan to address the issues of Proximity to Surface Waters. Although this Work Plan is separate it showed by viewed in conjunction with the Water Quality Management Plan, Main Drain 2012. Any water leaving a grower's field reaches the Main Drain Canal, and thus has been monitored as a part of that Management Plan, as well as the prior years leading to the development of that plan.

Item 1 – Assessment Methodology

This paragraph deals with two items. The first is that irrigation practice is not considered. This is clearly addressed in the Farm Evaluation Template. This is the proper place, as the grower knows the irrigation details and practices. The Order had two ways for a grower to need to complete a Sediment and Erosion Control Plan. One was from the SDEAR plan at the macro level, and the other was from the Farm Evaluation Template, which dealt with the specific farm and irrigation practices. There is no requirement in Section VI of the MRP to include irrigation practices. Expanding the Order to include irrigation practices would require proper notices and public meetings.

However, it is also clear that the lands within the BVC originally all had drains which connected through a series of drains to the Main Drain Canal. These drains are all off farm and are Waters of the State. So it does make sense for the BVC to address the potential for irrigation run-off to carry sediment on a Coalition wide basis, as the issues are very similar for all of the parcels. Thus one Districtwide plan can be submitted to address similar issues throughout the Coalition. This is addressed in the schedule below. The thought is this would eliminate the need for any current individual Sediment and Erosion Control Plans based on sediment from irrigation..

Similarly, this water all eventually ends in the Main Drain, which has a management plan, Water Quality Management Plan, Main Drain – August 2012. There were five areas of concern in the Main Drain Canal: (1) Registered pesticides, (2) Toxicity, (3) Legacy Pesticides and Trace Metals, (4) DO and pH, and (5) Salinity. Sediment, erosion and turbidity were not areas of concern for the Main Drain Management Plan.

The second item questioned is the issue of proximity to surface waters. The letter states "All areas including those estimated to have a potential for sediment erosion less than 5 tons/acre due to rainfall, should be evaluated for risk for sediment discharge based on the proximity to water bodies." As discussed above essentially all lands within the BVC at one time were capable of having irrigation run-off into the Districtwide system of drains. So initially all parcels had "proximity" issues, as all parcels had flood or furrow irrigation and had run-off. This is no longer true. As irrigation systems are converted to drip irrigation, connections to drains are removed, and many of the drains are also removed.

As the irrigation system was built back in the 1870's, long before pumps, supply canals all were built at elevations above the farmland, so water could gravity flow onto the fields for irrigation. The irrigation system continues to operate this way, so field water cannot flow back up into the canals, it can only flow down into the drains. Attached are plans showing the BVWSD Drains, BVWSD Canals, and the BVWSD Canals and Drains combined.

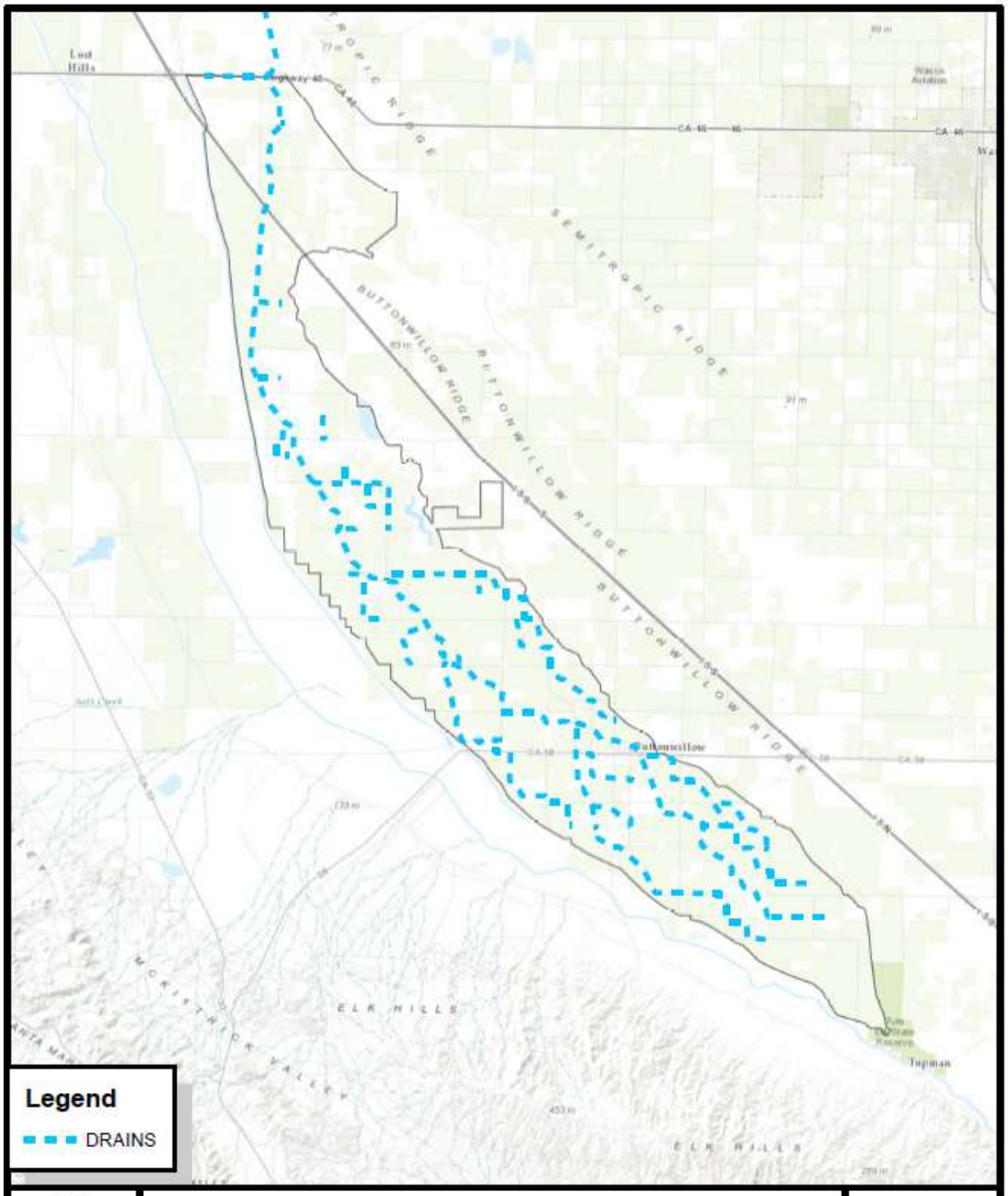
The Buena Vista Water Storage District and lands of the BVC are set up like a two story house with a basement. Water enters the District in the Eastside and Westside Canals. Water is delivered from these canals to smaller canals. All canals supply water to fields. Some fields using furrow or flood irrigation techniques have surface run-off water which go into drains. The canal is the upper floor of the house, with an elevation higher than the adjacent fields, as almost all fields are supplied water from canals by gravity flow. The field is the ground level floor. The drains are all below field grade, so the drain water gravity flows from the field into the drain which is the basement. Water cannot flow up from a drain into a canal. All drains connect and feed into the Main Drain Canal. (Note: this is the only drain which is called Canal, as it is more than a tailwater drain.) In addition to no water leaving the BVWSD in the Main Drain Canal, the Main Drain Canal has many control structures which would enable sediment to settle out of the water and settle in the Main Drain Canal. But water cannot flow into the Kern River Flood Channel Canal, the Eastside Canal, the Westside Canal, or any other canal from adjacent fields.

Item 2 – Waters of the State

The BVC understands the broad definition of Waters of the State. Regardless, all drain water is kept within the District as it is reclaimed and used by growers. BVWSD has not had any drain water leave the District in the Main Drain Canal since May of 2013. In 2014 and 2015 no drain water crossed north of I-5, which is about 3 miles south of Highway 46. The Main Drain Canal delivers water to the Kern Wildlife Refuge, and also in rare instances carries storm water out of the District. However, as indicated above in Item 1, the rainfall does not subject any lands in the BVC to erosion. The irrigation water in drains never leaves the District and never reaches other Waters of the State where there are significant beneficial uses besides agriculture.

But the best solution is for growers to capture their irrigation tailwater on-farm, and reclaim it themselves, rather than letting the neighbor reclaim it. The BVC, with the Buena Vista Water Storage District will develop a plan, see proposed schedule below, to help implement the change to eliminate or drastically reduce irrigation water leaving the farms. As shown in the original SDEAR, the storm run-off is essentially inconsequential for potential for erosion, and the issues are simply the irrigation run-off.

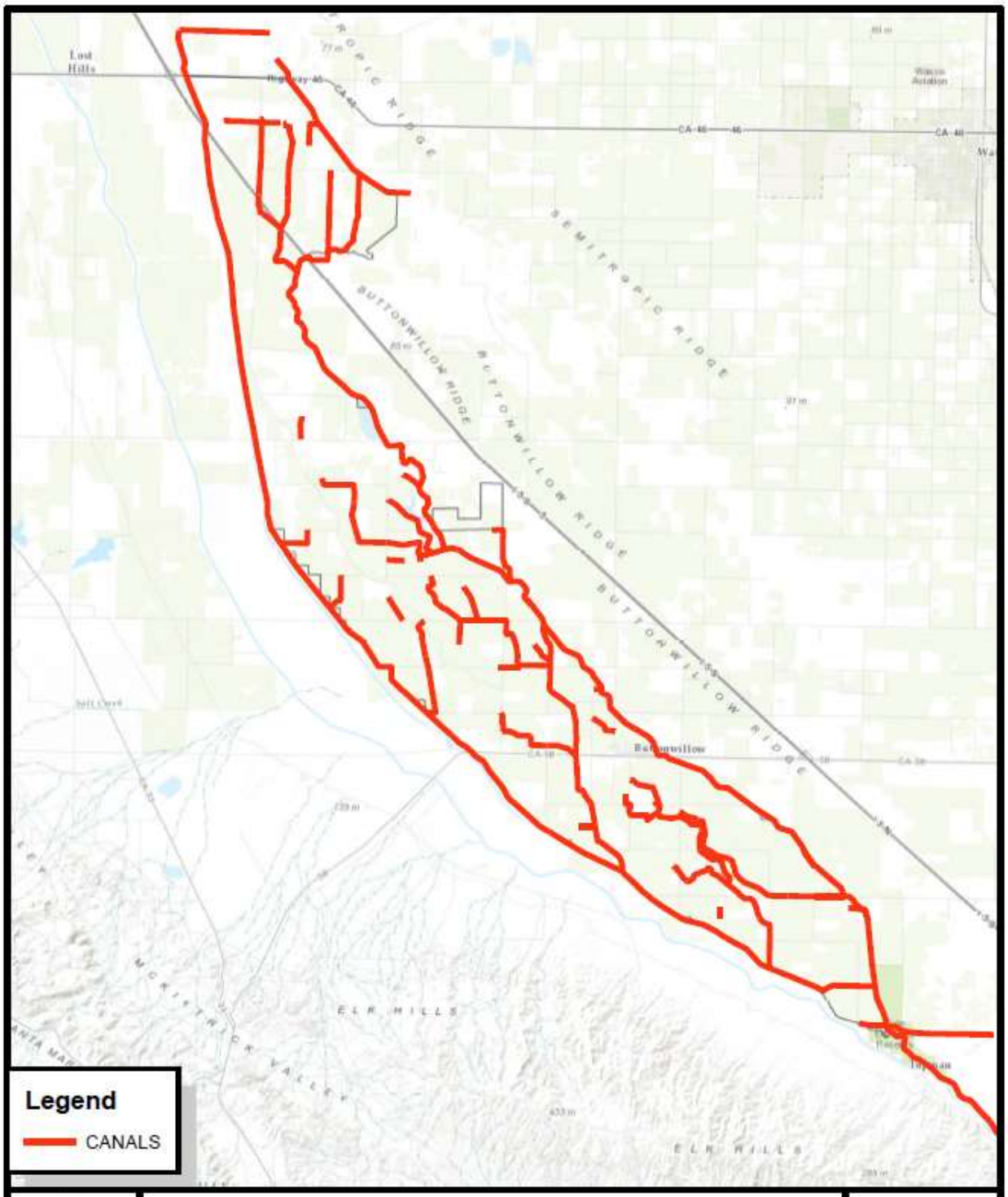
The Table below, *Main Drain Canal at Highway 46 from Monthly IRLP Testing*, indicates several things. In 2014 the BVWSD changed its policy on delivering water to the Kern Wildlife Refuge. Instead of using the path previously used, crossing Highway 46 in the Westside Canal, the delivery canal was changed to the Main Drain Canal. This drain is at the low point of the District, so any percolation from the Main Drain Canal would have a smaller impact on the lands above the perched water table of the BVWSD. (This will help the high vulnerability associated with the perched water.) That is why the flow rates, when present, are higher than seen in years 2010-2013. Also the turbidty results were much lower despite the higher flows and velocities, as this is water from the SWP. This would indicate two things: the high flows do not cause erosion or scouring, and the irrigation drainage has high turbidity.



BUENA VISTA WATER STORAGE DISTRICT

DISTRICT DRAINS

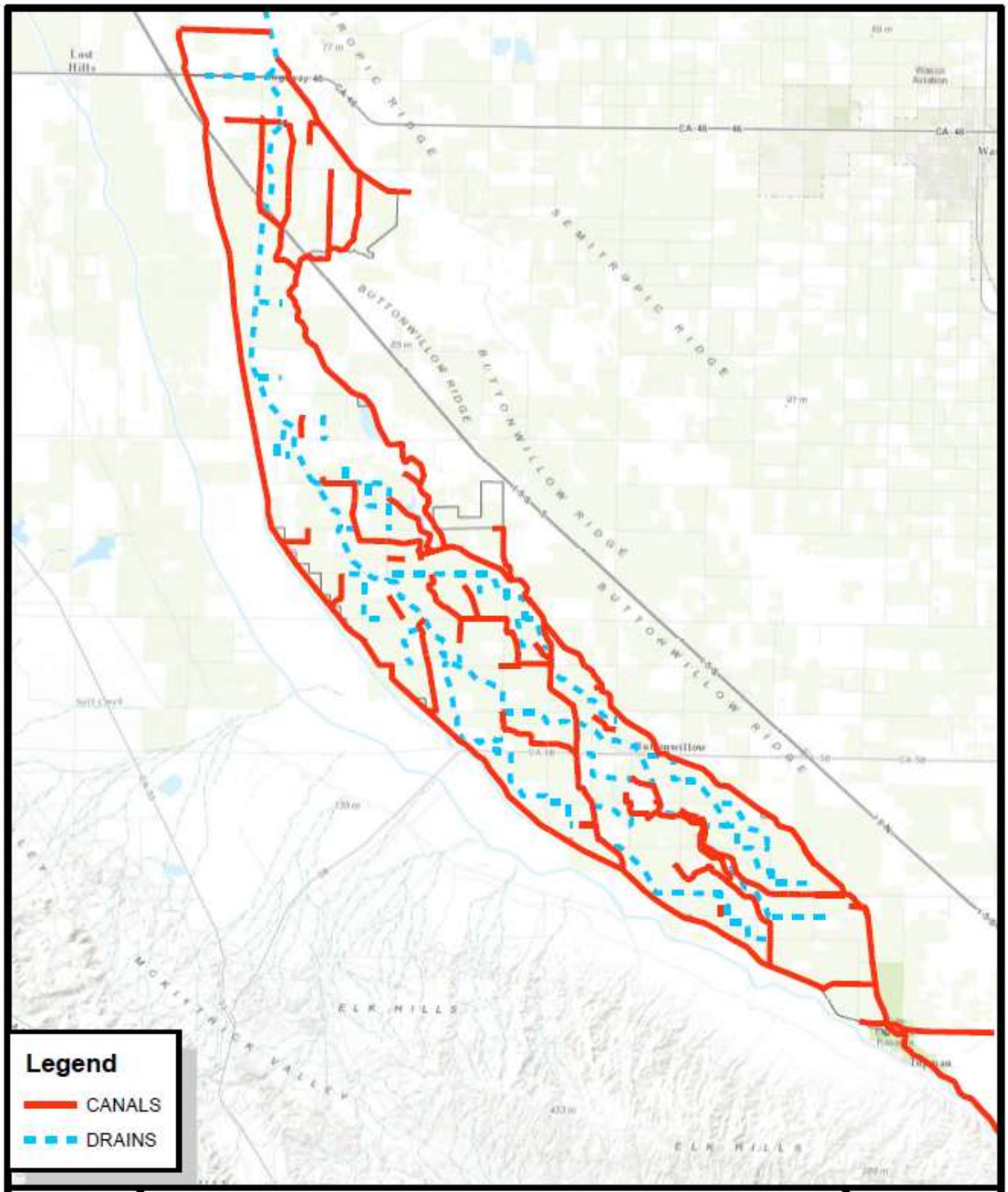
SHEET
1 of 1



BUENA VISTA WATER STORAGE DISTRICT

DISTRICT CANALS

SHEET
1 of 1


Legend
CANALS
DRAINS
BUENA VISTA WATER STORAGE DISTRICT
DISTRICT CANALS & DRAINS
SHEET
1 of 1

Main Drain Canal at Highway 46 from Monthly IRLP Testing												
	2015		2014		2013		2012		2011		2010	
	Flow	Turbidity	Flow	Turbidity	Flow	Turbidity	Flow	Turbidity	Flow	Turbidity	Flow	Turbidity
Jan					1	56.6	9	4.54	0	36		37.3
Feb	70.2	0.86			2	44.9	3	35.6	18	72.1		36.6
Mar					0	37.9		51	0	73.9		43.9
Apr					4	69.6		99.1	25	39.3	6	57.8
May								89.2	44	20.3	4	60.2
June									24	185	15	99.9
July									11	57.4	4	43.7
Aug			57.7	4.7					47	338	30	121
Sept			45.8	3.3				38.6	30	89.9	5	112
Oct			60.4						14	46.4		
Nov			64.1	2.2								
Dec												

Flows to Kern Wildlife Refuge - not drainwater.

This would support the results of the RUSLE formula, very low erosion, while confirming the Regional Boards concern on irrigation water. The grower's field processes used to help the water seep into the clay soils, also allow for sediment flows during irrigation.

Item 3 - Assessment Results

The SDEAR determined no lands were subject to erosion, which makes sense since this area was naturally a swamp, where river waters lost energy and stopped, and the fine soil particles in solution finally settled. There is no justification to look at the proximity issue for storm run-off. The justification is only if there are lands subject to erosion, which the SDEAR found, and the WaterBoard confirmed with its conditional approval that there were none. However, lands which use District drains need addressing, regardless of their proximity.

However it is also helpful to quantify this sediment problem. Although the water flowing into the Main Drain Canal is not metered, it was all reclaimed and used by other growers in 2014 and 2015. The quantity of this water resold in 2015 was 2068 acre feet of water. For a 100 day irrigation season this would equal 10.3 cfs. For a 200 day season 5.2 cfs. This is essentially the entire flow in the Main Drain Canal all year long, 2068 acre-feet. As the many pictures have shown on the Main Drain Canal's monthly testing,

standing water may exist with zero flow. This is due to the irregular bottom at places, and the extremely low percolation rates of the Main Drain.

Historically flows leaving the District in the Main Drain Canal averaged over 10,000 acre feet, see Appendix B. This 10,000 a-f was after growers reclaimed what they could. In 2015 the flows were reduced to 2068 acre feet, and all reclaimed within the District. The District will continue to change, and reduced acreage of row crops will likely diminish the flows even more, as land is converted to drip irrigation. Some growers are even considering drip irrigation on cotton and alfalfa fields. The flows in the Main Drain Canal have reduced severely since it first came on the spotlight of the Regional Board. The annual drainage flows in the Main Drain Canal are 80% less than they were just 6 years ago, and all now are contained within the District. Appendix B shows the Water Balance Table for BVWSD from 1968-2015, which has a column titled Goose Lake Outflow, which is the water in the Main Drain Canal leaving the District at Highway 46.

The memo said of the proposed revised SDEAR plan that it "should not be limited to parcels currently enrolled in the Coalition." Clearly the plan is limited to studying irrigated lands. Per The Order "The objective of the report is to determine which Member operations are within such areas, and need to develop a Sediment and Erosion Control Plan." The Order specifically states this report's only purpose is to establish if a Member need to develop a Sediment and Erosion Control Plan. The submitted SDEAR does this, and the determination was that no lands required this report, again which makes sense in lands naturally forming a swamp. It is understood that irrigation might raise sediment issues, especially lands connected by drains. And the BVC will address lands within the primary boundary of the BVC, and are short term currently fallow, and possibly not enrolled in the BVC. As these lands will likely be enrolled when water is available, it makes no sense to omit these lands from the study now. However, with SGMA and other regulatory issues, lands not in Districts are not likely to be developed in the future, and only BVWSD lands will be addressed if they currently are not irrigated and not enrolled. However conservation lands will not be addressed, as they are not irrigated, and do not have field practices to loosen the soil to allow for percolation, which can also cause sedimentation flows.

The Order clearly limits the scope of the report to covering currently enrolled parcels. However, this report does cover lands historically farmed which are currently fallowed within the BVWSD. There are no lands outside the BVWSD which are historically farmed and currently fallow. Due to physical restraints of bad water, boundary restraints, political restraints of SGMA, it is unlikely any significant development will occur outside the boundaries of the lands currently enrolled in the BVC. Lands enrolled in the BVC were all analyzed and found to not be subject to erosion. No Coalition work is required for potential future Members.

Should any lands join the BVC that were not covered by this report, they can be analyzed subsequent to their enrollment.

Item 4 – Certification Statement

This statement will be included.

Summary

The BVWSD needs to develop a plan which will allow for phasing out of the use of drains to collect irrigation tailwater, and require all irrigation tailwater to be captured on-farm, or if necessary to drain, to be permitted by the BVWSD. This will help the BVWSD control the "permitted drain water." Lands

permitted would be occasionally tested for turbidity, with the thought that the permit would likely require a detention pond prior to entering the drain system to capture sediments. The Main Drain will stay in place, as it is the storm drain for the BVWSD, or the "Main Drain Watershed."

The Maples area has no drains, and the Maples Canal is above all fields. Growers in the Maples area capture their irrigation tailwater on farm. The Maples Service Area does not have any sedimentation issues, storm or irrigation. It is the lowpoint of lands in all directions.

Below is a proposed schedule for the steps necessary for the sediment workplan to be developed by the BVC in conjunction with the BVWSD in lieu of individual growers developing an individual Sediment and Erosion Control Plan.

I. Develop a map showing parcels using the BVWSD drainage system. 4 months after approval of Workplan by the Regional board.
II. Develop BVWSD Required Irrigation Practices – 10 months after Workplan approval from Regional Board.
III. Get BVWSD Board of Director's Approval – 6 months after Practices Approved by Regional Board.
IV. Interim Operation of Drains and Main Drain – BVWSD to continue to work with growers to limit flows in drains, and to keep flows, should they exist, from leaving the District. 0-5 years.
V. Implement – Require BVWSD temporary permits for drain discharge valid for up to 5 years. Growers to by then have designed and built an on farm system to capture any tailwater on farm, or get a renewable permit in accordance with Approved Practices.

Flows leaving the District in the Main Drain Canal used to average over 10,000 acre-feet per year. For the last three years there has been zero drain water leaving the BVWSD. This is due to multiple reasons:

1. Management and Grower Effort
2. Conversion of Crops to Drip Irrigation.
3. Implementation of a Water Toll in 2013.
4. Lands Fallowed Due to Drought.

Where water once flowed in the Main Drain Canal steadily, it has become another of Kern County's ephemeral streams. It has been since April 2013 since drain water has left the BVWSD, and currently it is only occasionally that water is flowing in the Main Drain Canal at 7th Standard Road, in the middle of the BVWSD. The BVWSD will continue to keep control structures in the Main Drain Canal, so that any sedimentation that does enter it from irrigation will be captured, and velocities in the Main Drain Canal will continue to be well below scour velocities.

APPENDIX A

ORIGINAL SDEAR

BSK Associates
Engineers & Laboratories

SEDIMENT DISCHARGE AND EROSION ASSESSMENT REPORT (SDEAR)

BUENA VISTA COALITION
WASTE DISCHARGE REQUIREMENTS GENERAL ORDER FOR GROWERS WITHIN THE TULARE LAKE BASIN AREA THAT ARE MEMBERS OF A THIRD-PARTY GROUP
Order R5-2013-0120

BSK E15-007-01F

PREPARED FOR:

MR. TIM ASHLOCK
BUENA VISTA WATER STORAGE DISTRICT
525 NORTH MAIN STREET
BUTTONWILLOW, CALIFORNIA 93206

FEBRUARY 3, 2015

SEDIMENT DISCHARGE AND EROSION ASSESSMENT REPORT (SDEAR)
BUENA VISTA COALITION

Prepared for:

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Buena Vista Water Storage District
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BSK E15-007-01F

February 3, 2015

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Figures

1 INTRODUCTION

BSK Associates (BSK) has prepared this Sediment Discharge and Erosion Assessment Report (SDEAR) for the Buena Vista Water Quality Coalition (Coalition). The boundaries of the Coalition are presented on Figure 1. This SDEAR is required by Section VIII (F) of the California Regional Water Quality Control Board (CRWQCB) Order R5-2013-0120 "*Waste Discharge Requirements General Order for Growers within the Tulare Lake Basin Area that are Members of a Third-Party Group*".

Section VI of the Monitoring and Reporting Program (MRP) of the order states:

> *"The third-party shall prepare a Sediment Discharge and Erosion Assessment Report. The report shall be submitted to the Executive Officer for review. The goal of the report is to determine which irrigated agricultural areas within the Western Tulare Lake Basin Area are subject to erosion and may discharge sediment that may degrade surface waters. The objective of the report is to determine which Member operations are within such area, and need to develop a Sediment and Erosion Control Plan. The report must be developed to achieve the above goal and objective and must at a minimum, provide a description of the sediment and erosion areas as a series of ArcGIS shape files with a discussion of the methodologies utilized to develop the report."*

This report presents the discussion of methodologies utilized to develop the report. The ArcGIS shape files are submitted as a separate attachment.

2 RISK CALCULATION

The potential risk is based on two factors. The estimated annual soil loss and the estimated distance to a surface water body. A discussion of these two factors is presented in the following sections.

2.1 ESTIMATED ANNUAL SOIL LOSS

BSK adapted the Revised Universal Soil Loss Equation (RUSLE) to estimate annual soil loss. BSK selected the RUSLE method as the CRWQCB has developed and adapted this method for use with the California's *National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities*. The CRWQCB develop GIS information for the factors used in the RULSE equation.

RULSE is composed of six factors that are used to calculate an estimated loss of top soil due to rainfall erosion. The RULSE equation is presented below:

$$A = (R) \times (K) \times (L) \times (S) \times (C) \times (P)$$

Where,

A – Estimated soil loss in tons per acre per year (tons/acre-yr)
R – Rainfall Erosivity
K – Soil Erosivity
L – Length of the slope
S – Steepness of the slope
C – Crop coefficient
P – Practice coefficient

The length of the slope (L) and the steepness of the slope (S) were combined by the CRWQCB in their GIS data set and are therefore presented together as the factor LS. It is noted for this discussion the crop coefficient and the practice coefficient are conservatively taken as 1 for this discussion and are therefore excluded.

Rainfall erosivity is presented as isoerodent maps in the US EPA *Stormwater Phase II Final Rule* (Revised 2012). The isoerodent maps developed for the area surrounding the Coalition are presented on Figure 2. The closest isoerodent line to the Coalition boundary is 10, therefore an R value of 10 was used for calculations throughout the Coalition.

GIS data for K and LS are available from the State Water Resources Control Boards' ftp server at ftp://swrcb2a.waterboards.ca.gov/pub/swrcb/dwq/cgp/Risk . The K factor for the Coalition is presented on Figure 3, and LS is presented on Figure 4.

Combining the GIS data for R, K and LS provides an estimated soil loss in tons per acre per year (ton/acre-yr) which is presented on Figure 5.

2.2 APPLICABLE SOIL LOSS THRESHOLDS

The National Resources Conservation Service (NRCS) classification for sustainable agriculture soil loss is 5 tons/acre (McCormack, 1982). This is a conservative value compared to the CRWQCB's *NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities* which uses a threshold of 15 tons/acre per project length as the threshold between low sediment erosion risk and medium sediment erosion risk.

BSK chose the 5 tons/acre-yr threshold as it is more conservative value and is used by the NRCS as a sustainable agricultural practice.

2.3 RECEIVING WATER BODIES

The Coalition's sampling and analysis plan includes surface water sampling of canals and drains through the Coalition's boundaries. BSK could not identify natural surface water bodies that were adjacent to agricultural (farm) operations. Therefore these water bodies are used as potential receiving water

bodies, although through maintenance and the operation of man-made (i.e. concrete, metal) structures, sediment accumulation throughout this system can be minimized. The location of these canals and drains are presented on Figure 6.

For purposes of this discussion, BSK assumes that no farmland is greater than 500 meters in length. Farms located at a greater distance are presumed to have discharge which would be comingled or infiltrated before reaching surface water bodies. Therefore, areas farther than 500 meters from the surface water receiving bodies are excluded from further analysis.

3 RISK DETERMINATION

The estimated soil loss (Figure 5) was overlaid with the 500 meter surface water boundaries (Figure 6) to determine areas of high sedimentation risk. These areas are presented on Figure 7.

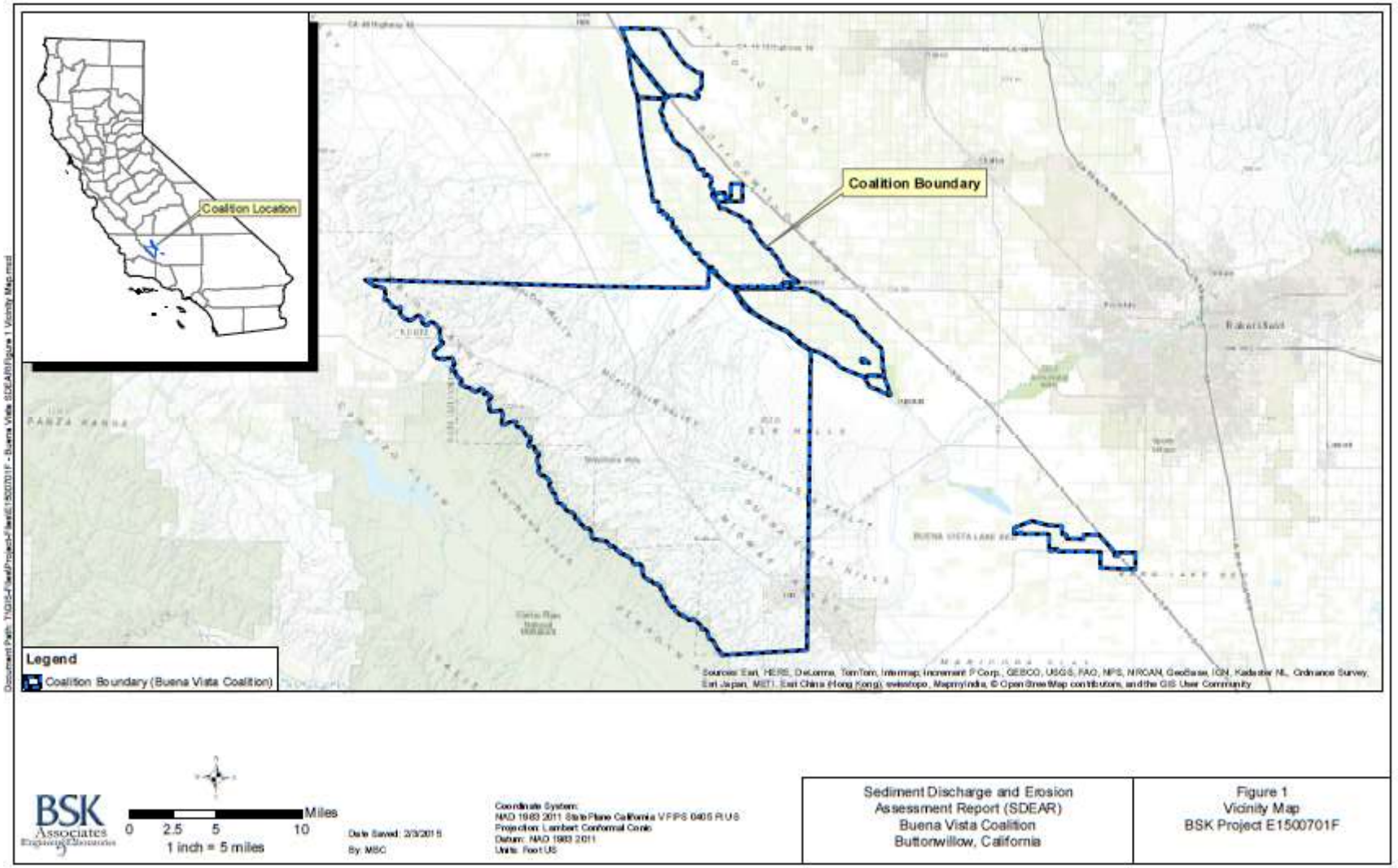
The final risk determination indicates that that all farms within the Coalition would meet the "low risk" criteria in regards to sedimentation of water bodies.

4 REFERENCES

SWRCB. *State Water Resources Control Board: Division of Water Quality. Construction general Permit Fact Sheet, 2009, amended by 2019-0014 Department of Water Quality*, page 28, January 30, 2015.

McCormack D.E., Young K.K., Kimberlin L.W. 1982. *Current criteria for determining soil loss tolerance In Determinants of Erosion Tolerance, ed*. Karl D.M., 95-111. Madison: American Society of Agronomy.

FIGURES


Coalition Location
Coalition Boundary
Legend
Coalition Boundary (Buena Vista Coalition)
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
BSK Associates
0 2.5 5 10
Miles
1 inch = 5 miles
Date Saved: 3/3/2015
By: MBC
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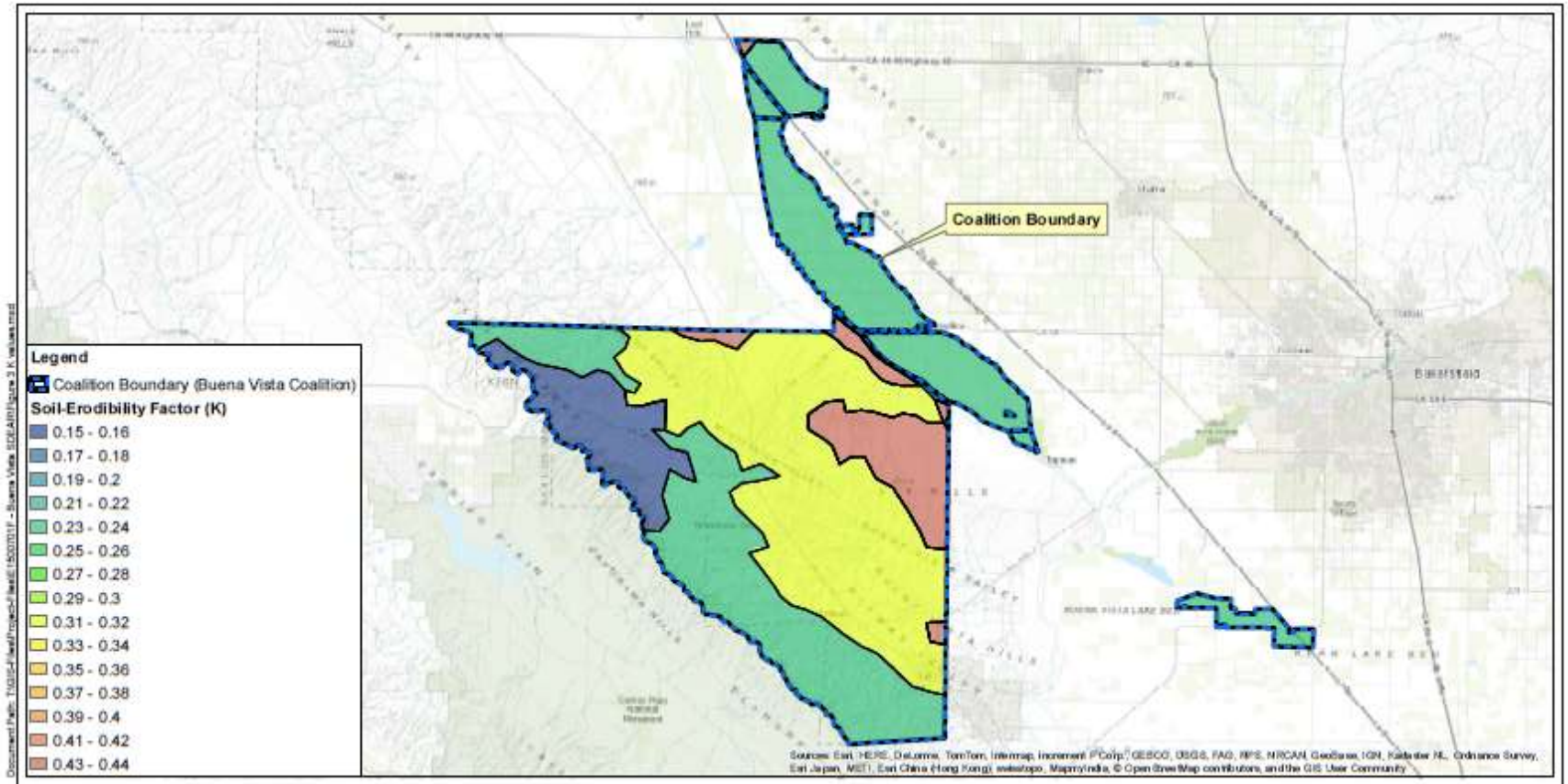
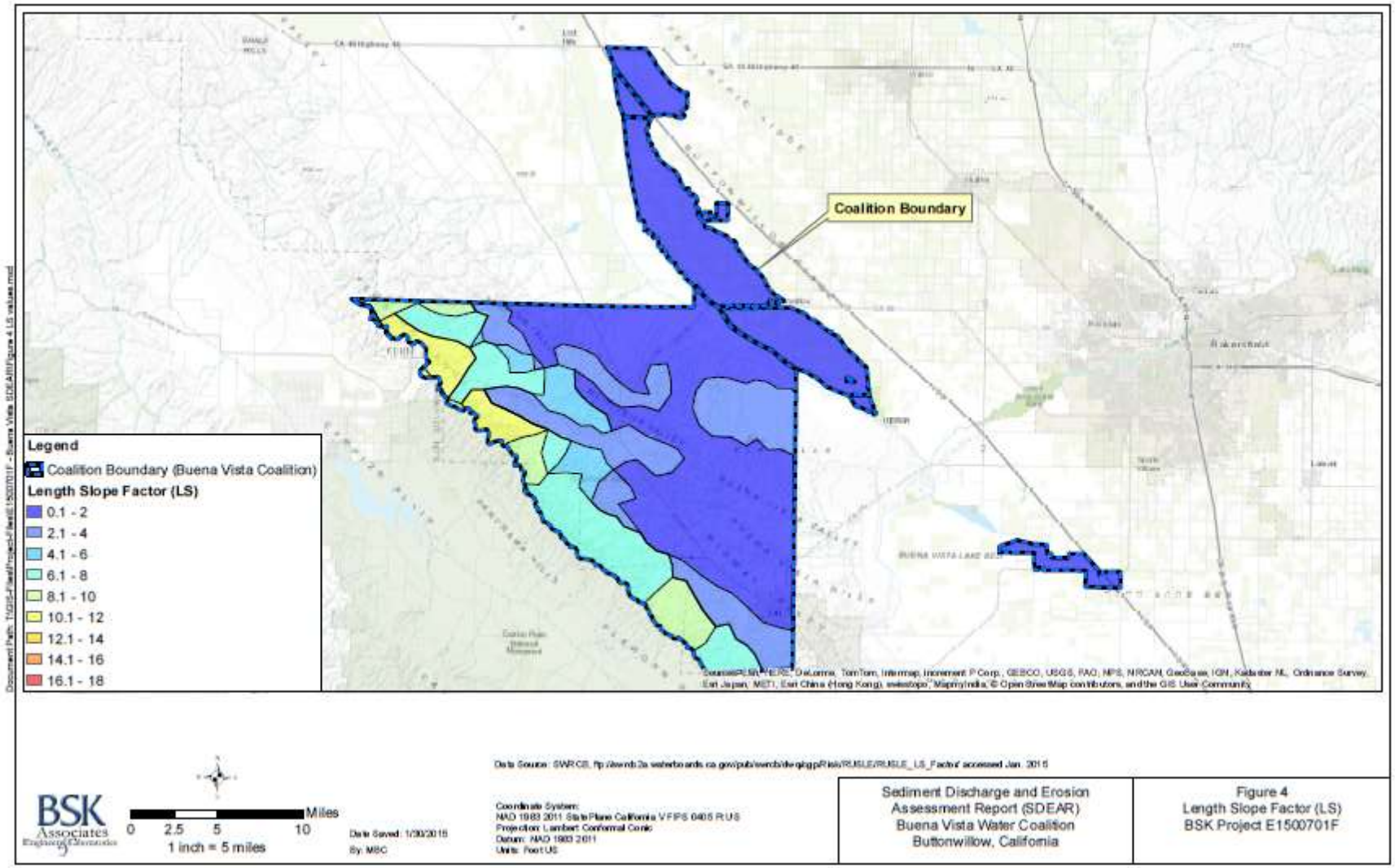
NAD 1983 2011 StatePlane California V FIPS 0405 FUS
Projection: Lambert Conformal Conic
Datum: NAD 1983 2011
Units: Feet US
Sediment Discharge and Erosion
Assessment Report (SDEAR)
Buena Vista Coalition
Buttonwillow, California
Figure 1
Vicinity Map
BSK Project E1500701F



BSK Associates Engineering & Laboratories

Sediment Discharge and Erosion Assessment Report (SDEAR)
Buena Vista Coalition
Buttonwillow, California

Figure 3
Soil-Erodibility Factor (K)
BSK Project E1500701F


Coalition Boundary
Legend
Coalition Boundary (Buena Vista Coalition)
Length Slope Factor (LS)
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2.1 - 4
4.1 - 6
6.1 - 8
8.1 - 10
10.1 - 12
12.1 - 14
14.1 - 16
16.1 - 18
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BSK Associates
0 2.5 5 10 Miles
1 inch = 5 miles
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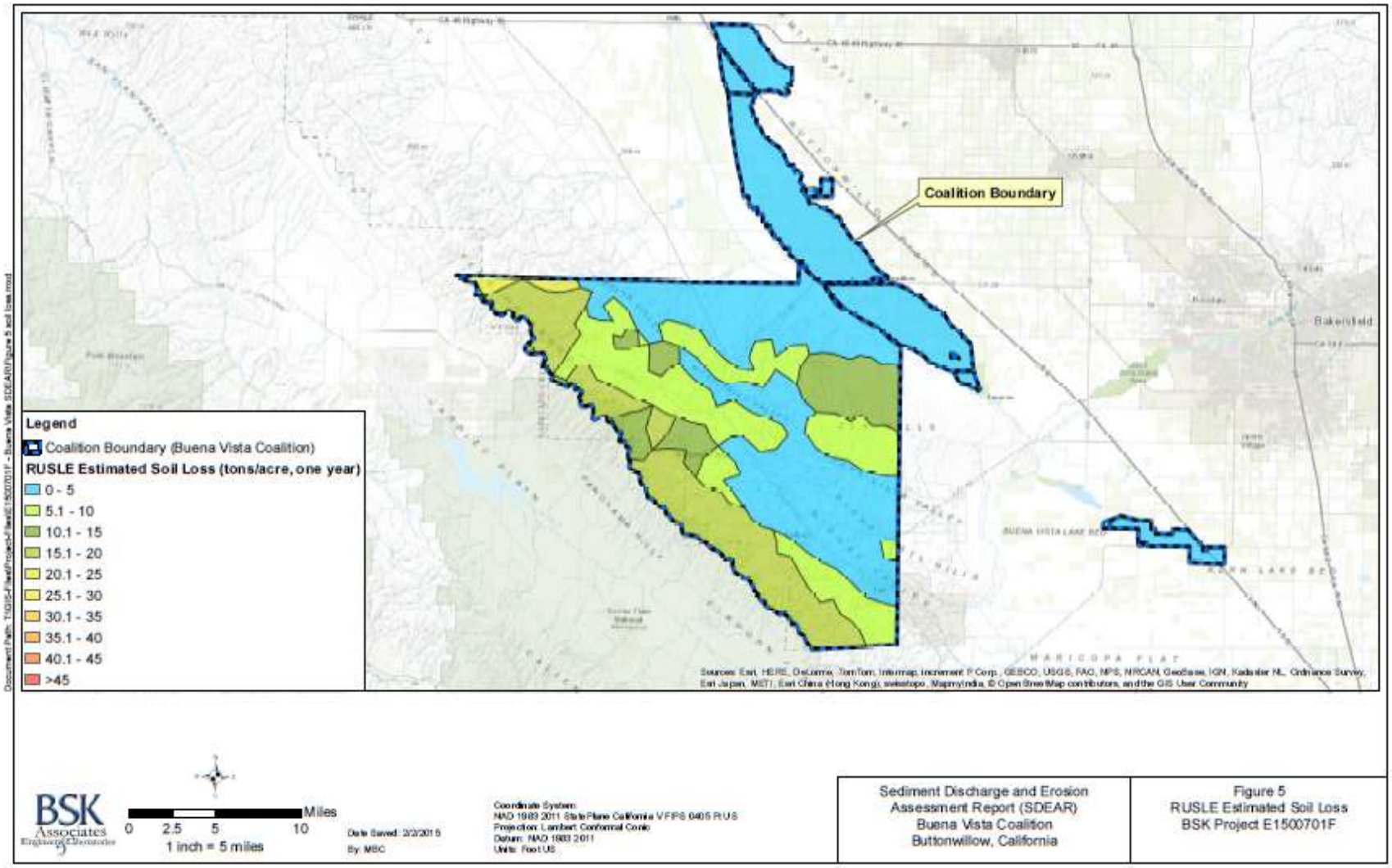
By: MBC
Sediment Discharge and Erosion Assessment Report (SDEAR)
Buena Vista Water Coalition
Buttonwillow, California
Figure 4
Length Slope Factor (LS)
BSK Project E1500701F


Coalition Boundary
Bakersfield
Legend
Coalition Boundary (Buena Vista Coalition)
RUSLE Estimated Soil Loss (tons/acre, one year)
0 - 5
5.1 - 10
10.1 - 15
15.1 - 20
20.1 - 25
25.1 - 30
30.1 - 35
35.1 - 40
40.1 - 45
>45
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Miles
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Sediment Discharge and Erosion
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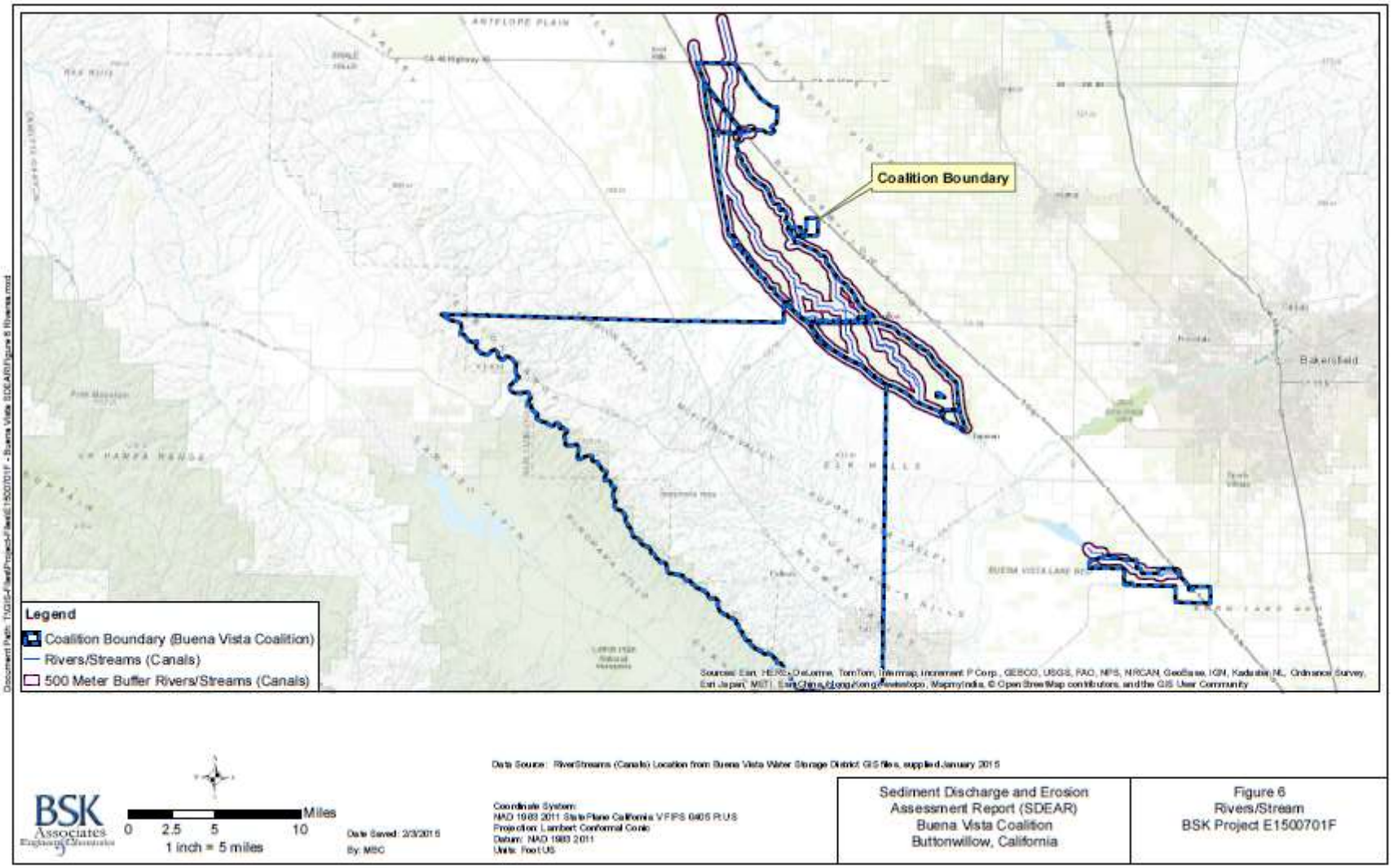
Figure 5
RUSLE Estimated Soil Loss
BSK Project E1500701F


Coalition Boundary
Bakersfield
Legend
Coalition Boundary (Buena Vista Coalition)
Rivers/Streams (Canals)
500 Meter Buffer Rivers/Streams (Canals)
Miles
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1 inch = 5 miles
Date Saved: 2/3/2015
By: MBC
Data Source: RiverStreams (Canals) Location from Buena Vista Water Storage District GIS files, supplied January 2015
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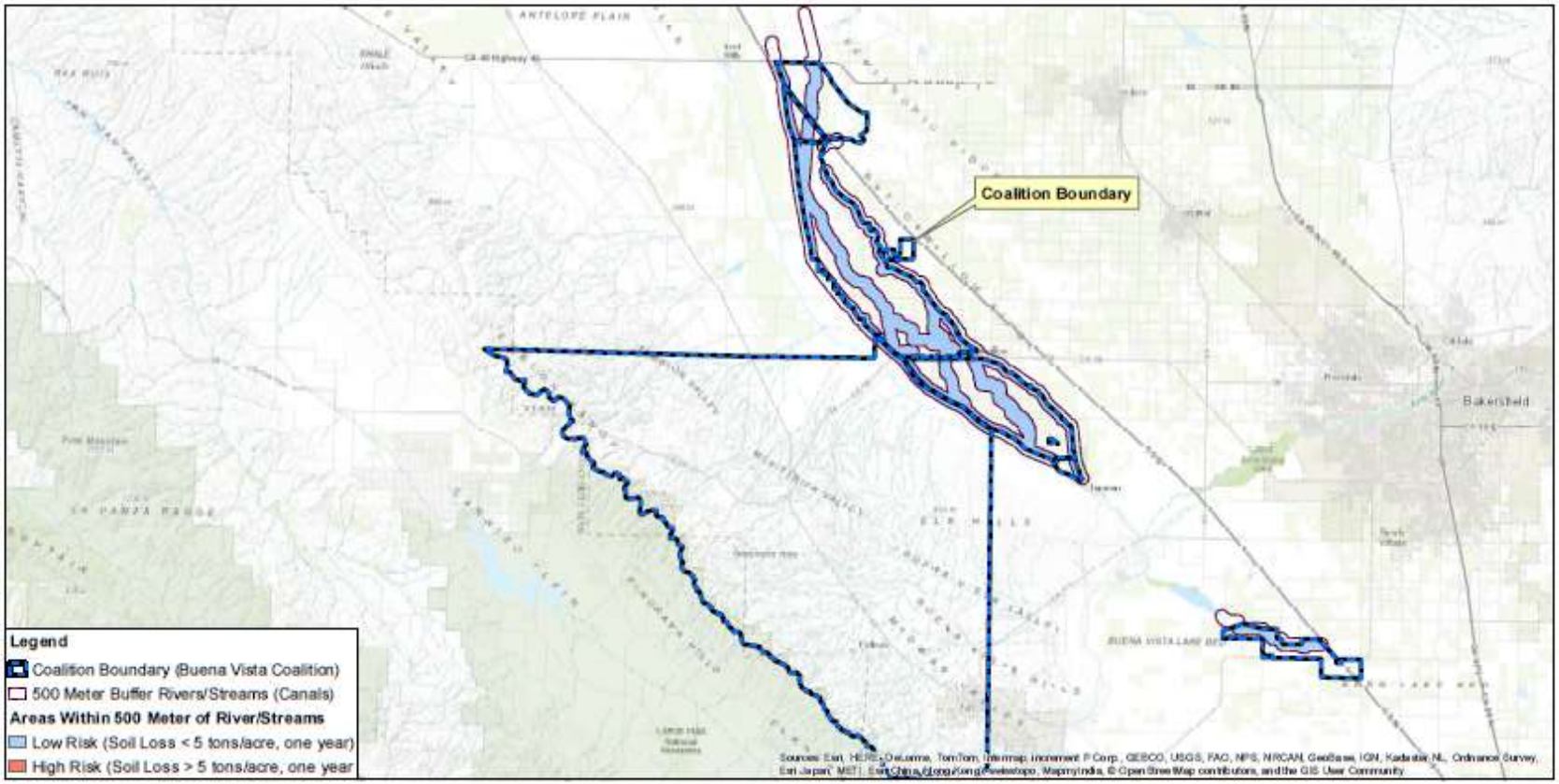
Sediment Discharge and Erosion Assessment Report (SDEAR)
Buena Vista Coalition
Buttonwillow, California
Figure 6
Rivers/Stream
BSK Project E1500701F



Document Path: T:\GIS-Files\Projects-Files\E1500701F - Buena Vista SDEAR\Figure 7 High Risk.mxd

BSK Associates Engineering & Environmental

0 2.5 5 10 Miles

1 inch = 5 miles

Date Saved: 3/3/2015

By: MBC

Data Source: RiverStreams (Canals) Location from Buena Vista Water Storage District GIS files, supplied January 2015

Coordinate System:
NAD 1983 2011 StatePlane California VI FIPS 0405 RUS
Projection: Lambert Conformal Conic
Datum: NAD 1983 2011
Units: Foot US

Sediment Discharge and Erosion Assessment Report (SDEAR)
Buena Vista Coalition
Buttonwillow, California

Figure 7
High Risk Areas
BSK Project E1500701F

APPENDIX B

BUENA VISTA WSD WATER BALANCE 1968-2015

Historical 1968-2015 BVWSD Water Balance

All units in AF

Year	Apr-Jul % of Current Average 464,072	Bvwsd KR Entitlement	Type Of Year	1 Buttonwillow (Supply)	2 Buttonwillow Canal Losses	3 Outlet Canal Lossses	4 Maples (Supply)	5 Maples Canal Losses	6 **Total Supply**	7 Total Crop Demand	8 Delivered Water Supply to the Field	9 Crop Demand Balance (+/-)	10 Total Canal Recharge	11 Spill @ North of Hwy 46	12 Yearly Water Balance	13 **Cummulative Water Balance**
									Sum Col 1 thru 5		Col 1+4	Col 8-7	Col 2+3+5		Col 9+10-11	
1968				68,877	19,881	5,750	2,130	715	97,353	107,229	71,007	(36,222)	26,346	4,054	(13,930)	**(13,930)**
1969				127,598	44,301	15,363	5,028	1,571	193,861	107,229	132,626	25,397	61,235	16,077	70,555	**56,625**
1970	69	95059		90,070	18,221	4,184	2,724	1,113	116,312	104,238	92,794	(11,444)	23,518	9,086	2,988	**59,613**
1971	53	60579		68,101	32,260	0	1,721	931	103,013	105,076	69,822	(35,254)	33,191	4,897	(6,960)	**52,653**
1972	28	22615		50,549	24,694	2,996	1,077	774	80,090	99,391	51,626	(47,765)	28,464	740	(20,041)	**32,612**
1973	156	240806		103,130	29,368	12,001	2,740	416	147,655	111,640	105,870	(5,770)	41,785	12,137	23,878	**56,490**
1974	115	175024		110,153	38,543	11,577	11,414	1,650	173,337	115,768	121,567	5,799	51,770	6,121	51,448	**107,938**
1975	83	110424		106,374	33,750	9,105	5,490	1,522	156,241	121,174	111,864	(9,310)	44,377	7,384	27,683	**135,621**
1976	23	14637		40,659	20,138	2,642	1,749	310	65,498	115,063	42,408	(72,655)	23,090	4,463	(54,028)	**81,593**
1977	21	10037		9,363	1,754	0	1,010	0	12,127	111,616	10,373	(101,243)	1,754	420	(99,909)	**(18,316)**
1978	236	430247		114,842	43,138	15,110	5,455	1,171	179,716	120,059	120,297	238	59,419	13,877	45,780	**27,464**
1979	90	129312		109,844	46,696	11,640	5,322	1,908	175,410	111,286	115,166	3,880	60,244	12,807	51,317	**78,781**
1980	214	413487		145,665	46,538	18,260	6,028	2,009	218,500	112,780	151,693	38,913	66,807	18,295	87,425	**166,206**
1981	54	63493		91,545	46,264	8,355	7,365	1,040	154,569	112,536	98,910	(13,626)	55,659	12,351	29,682	**195,888**
1982	172	258466		123,837	47,961	15,489	7,143	1,622	196,052	112,883	130,980	18,097	65,072	15,904	67,265	**263,153**
1983	333	672947		122,634	48,450	15,592	6,739	1,503	194,918	97,927	129,373	31,446	65,545	13,264	83,727	**346,880**
1984	91	140210		138,627	47,754	10,114	7,871	1,884	206,250	109,366	146,498	37,132	59,752	16,478	80,406	**427,286**
1985	91	123414		111,630	46,451	8,871	5,655	2,035	174,642	106,262	117,285	11,023	57,357	16,123	52,257	**479,543**
1986	191	373600		135,733	40,267	14,402	6,717	2,157	199,276	103,154	142,450	39,296	56,826	24,589	71,533	**551,076**
1987	46	49638		96,521	35,400	4,129	6,489	763	143,302	99,168	103,010	3,842	40,292	14,916	29,218	**580,294**
1988	35	31264		76,184	30,040	5,163	4,711	800	116,898	103,320	80,895	(22,425)	36,003	16,309	(2,731)	**577,563**
1989	51	64688		76,266	39,043	6,288	5,697	1,258	128,552	100,317	81,963	(18,354)	46,589	5,080	23,155	**600,718**
1990	24	15434		58,215	24,978	4,257	5,371	685	93,506	105,159	63,586	(41,573)	29,920	4,165	(15,818)	**584,900**
1991	60	72322		52,359	23,595	5,727	4,218	622	86,521	105,075	56,577	(48,498)	29,944	4,558	(23,112)	**561,788**
1992	39	35774		41,602	29,696	3,202	3,952	529	78,981	110,298	45,554	(64,744)	33,427	3,927	(35,244)	**526,544**
1993	126	195142		108,369	39,167	5,064	5,221	698	158,519	113,622	113,590	(32)	44,929	8,641	36,256	**562,800**
1994	41	42620		83,713	36,135	7,952	6,102	1,899	135,801	103,758	89,815	(13,943)	45,986	5,612	26,431	**589,231**
1995	200	352629		133,309	55,359	12,404	7,957	2,262	211,291	112,902	141,266	28,364	70,025	28,394	69,995	**659,226**
1996	129	225263		140,248	42,455	10,167	599	9,256	202,725	113,409	140,847	27,438	61,878	23,555	65,761	**724,987**
1997	123	255635		141,268	51,548	16,677	7,496	1,855	218,844	106,883	148,764	41,881	70,080	26,978	84,983	**809,970**
1998	245	440707		117,795	35,697	16,687	7,556	1,033	178,768	113,188	125,351	12,163	53,417	31,760	33,820	**843,790**
1999	54	61263		112,538	31,414	5,839	9,128	2,305	161,224	106,919	121,666	14,747	39,558	23,067	31,238	**875,028**
2000	66	82637		96,589	37,239	6,700	7,716	3,168	151,412	102,937	104,305	1,368	47,107	13,851	34,624	**909,652**
2001	54	60956		65,002	24,919	4,920	3,981	852	99,674	99,924	68,983	(30,941)	30,691	7,060	(7,310)	**902,342**
2002	46	59088		57,399	32,200	3,642	4,006	654	97,901	93,321	61,405	(31,916)	36,496	5,035	(455)	**901,887**
2003	70	92114		66,667	36,359	3,976	5,389	621	113,012	97,971	72,056	(25,915)	40,956	9,913	5,128	**907,015**
2004	48	61677		51,125	40,994	9,424	4,522	693	106,758	102,224	55,647	(46,577)	51,111	9,098	(4,564)	**902,451**
2005	170	277525		102,087	32,237	11,779	6,928	1,842	154,873	104,800	109,015	4,215	45,858	7,864	42,209	**944,660**
2006	171	265011		120,223	34,039	15,366	10,426	2,551	182,605	104,196	130,649	26,453	51,956	12,591	65,818	**1,010,478**
2007	27	22617		83,224	20,291	8,069	4,913	1,167	117,664	98,519	88,137	(10,382)	29,527	7,867	11,278	**1,021,756**
2008	71	92063		61,152	21,276	10,579	4,716	1,011	98,734	91,705	65,868	(25,837)	32,866	4,093	2,936	**1,024,692**
2009	64	76028		56,033	30,430	3,881	4,929	780	96,053	97,361	60,962	(36,399)	35,091	575	(1,883)	**1,022,809**
2010	125	207133		77,902	36,495	12,607	6,307	1,440	134,751	101,362	84,209	(17,153)	50,542	2,907	30,482	**1,053,291**
2011	203	331207		105,218	34,915	16,002	6,570	1,510	164,215	129,773	111,788	(17,985)	52,427	1,817	32,625	**1,085,916**
2012	38	39062		64,939	27,701	5,948	5,477	1,452	105,517	115,158	70,416	(44,742)	35,101	2,823	(12,464)	**1,073,452**
2013	22	13670		37,147	15,366	0	2,402	766	55,681	114,572	39,549	(75,023)	16,132	246	(59,137)	**1,014,315**
2014	21	11716	DRY	0	0	0	0	0	0	100,436	0	(100,436)	0	0	(100,436)	**913,879**
2015	13	333	DRY	368	0	0	0	0	368	98,221	368	(97,853)	0	0	(97,853)	**816,026**
									0	0	0	0	0		0	**816,026**
Totals:				4,152,693	1,575,417	397,900	246,157	66,803	6,438,970	5,131,175	4,398,850	(732,325)	2,040,120	491,769		**816,026**

NOTE: **Columns 1-5 includes Kern River, State, Friant-Kern, Well and Reclamation Water**
Column 7 (Total Crop Demand) is based on data from ITRC Crop Use Tables from Cal-Poly SLO and BVWSD crop map reports
Column 11 represent water outside District boundaries and are deducted from the Yearly Water Balance